

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-13 are presently active in this case. The present Amendment amends Claim 5 and adds new Claims 6-13. The above Amendment shows all currently active claims and their status for the Examiner's convenience.

In the outstanding Office Action, Claim 5 was objected to for informalities. Claims 1-3 and 5 were rejected under 35 U.S.C. §103(a) as unpatentable over Nakashima et al. (U.S. Patent No. 5,207,266). Claim 4 was rejected under 35 U.S.C. §103(a) as unpatentable over Nakashima in view of Sevastakis (U.S. Patent No. 4,640,337). In response to all the rejections under 35 U.S.C. §103(a), Applicants respectfully traverse these rejections.

First, Applicants would like thank Primary Examiner Lin and Examiner Kerns for the courtesy of an interview granted to Applicants' representative on October 16, 2003, at which time the outstanding issues in this case were discussed. During the interview, the Examiners reviewed reference materials provided by the Applicants which discuss the unexpected results of uniform cooling across cooling channels. In response to Examiner Lin's suggestion, Applicants submit herewith a Declaration under 37 C.F.R. 1.132 to provide the additional data the Examiner requested.

In response to the rejections of Claims 1-3 and 5 under 35 U.S.C. §103(a) as unpatentable over Nakashima and Claim 4 as being unpatentable over

Nakashima in view of Sevastakis, Applicants respectfully traverse these rejections as discussed next.

Applicants submit herewith a Declaration under 37 C.F.R. 1.132 which shows unexpected results in the form of uniform cooling across the channels. In light of this Declaration and remarks below, Applicants respectfully traverse and request reconsideration of the rejection to Claims 1-3 and 5 under Nakashima and Claim 4 under Nakashima in view of Sevastakis. Applicants respectfully submit that even if Nakashima was combined with Sevastakis, even their combination fails to teach all the features of recited Claim 4. Accordingly, Applicants respectfully traverse and request reconsideration of these rejections based on these patents.

Briefly summarizing, Nakashima describes a water-cooled casting mold comprised of a maze of main channels 2a interposing bolt screwing holes 5a therebetween and branching portions 2c formed at both ends and the central portions of the main channels 2a. Increased channels 2b are provided at the central portion between the main channels 2a and the joining bolt screwholes 5a and extend disposed in parallel with the main channels 2a. Branch channels 2d are also disclosed, extending from branching portions 2c to the increased channels 2b.¹ Various widths and depths are disclosed to the different channels making up Nakashima's cooling maze. Exemplary embodiments of the present invention as claimed in claim 1 disclose channels that are separate, distinct, and unconnected from, and has substantially the

¹ See Nakashima at column 3, lines 21-32.

same depth as the other cooling channels, wherein the width of the individualized cooling channels varies based on a localized cooling requirement for the tightening member.

Nakashima is fundamentally different from the present application. In Nakashima, the cross-sectional area of the cooling channels changes at the bifurcation as the slit grooves repeat bifurcation and connection. In a repeated branching and merging design, several types of slit grooves exist and the respective slit grooves create differences in cooling (i.e., the water flow velocity). This change in flow velocity is mainly caused by a pressure loss that occurs at bifurcation connection and a change in cross-sectional area. This change in flow velocity cannot be eliminated in a design where branching and connection are repeated. Nakashima remedies this problem with a partial narrowing of the cooling channels by expanding the cross-sectional area of the part where the flows merge. However, from this method, the only effect is to expand the partially narrow cross-sectional area and the pressure loss as a result of bifurcation or connection cannot be eliminated, therefore the flow velocity cannot be made uniform.

The cooling water flow velocity in the slit grooves is a vital factor in changing cooling characteristics and unifying the flow velocity is indispensable for a cooling design of a mold for continuous casting in which uniform cooling is required.

In the Nakashima patent, the change in flow velocity as described above greatly influences cooling capacity and temperatures at areas with a slow flow

remarkably rise. This rise in temperature of the cooling wall induces boiling of the cooling water and accelerates non-uniformity of the cooling, thus causing a harmful influence on the quality of the molding pieces.

In the present application, the applied design of slit grooves with a curvature with different widths allows the slit grooves to be independent and no bifurcation or connection occurs in the course of a flow and thus, no change in the cross-sectional area occurs. Accordingly, there is no change in the flow velocity in one slit groove and thus a stable flow can be obtained.

In addition, the present application is designed so that if the degree of bending changes depending on the slit arrangement, the flow velocity of a slit groove with a large bending is slow, therefore by changing the slit width, the slits with different curvatures are set to be made uniform in pressure loss.

When this occurs, the cooling-water flow velocity has been equalized and the temperature of the slit grooves has also been made uniform. Accordingly, the present application is different from Nakashima which eliminates partial narrowing of sections in the cooling channels on the premise that bifurcation and connection exists.

Sevastakis includes semicircular overhanging channels which are alternatively provided in one slit groove. This design permits cooling water flow while the cross-sectional area of the cooling channel is being changed at all times. This causes whirlpools and stirring caused by change in the cross-sectional area and as a result expects an increase in the cooling area. Primary Examiner Lin agreed that the Sevastakis reference is not relevant art during

the personal interview. Thus, the rejection under this reference is deemed moot.

New Claims 6-13 have been added to vary the scope of protection recited in the claims. New Claim 6 is similar to Claim 1, but recites "the radius of curvature is not equal to the radius of said tightening members." New Claims 7-9 are similar to Claims 2, 3 and 5, respectively, but depend from Claim 6. Applicants respectfully submit that new Claims 6-9 are patentably distinguishable over the cited prior art because Nakashima uses straight lines for the cooling channels and Sevastakis has an equal radius of curvature to the tightening members.

New Claim 10 incorporates the subject matter of original Claim 4 into original Claim 1. Claims 11-13 parallel Claims 2, 3 and 5, respectively, but depend from Claim 10. New Claim 10 recites "wherein the width of a slit groove having a large curvature is larger than the width of a slit groove having a small curvature" which defines over the combination of references.² The Sevastakis reference clearly does not show the width of a slit groove having a large curvature is larger than the width of a slit groove having a small curvature. Thus, even if the combination of Nakashima and Sevastakis is assumed to be proper, the combination fails to teach each and every element of the claimed invention. Further, Applicants attach hereto Appendix I which clearly shows "the width of a slit groove having a large curvature is larger than the width of a slit groove having a small curvature." Accordingly, Applicants

² See attached Appendix I which clearly shows the above described features in reference numerals 22 and 23.

respectfully traverse, and request reconsideration of this rejection based on these patents.³

The present Amendment is submitted in accordance with the provisions of 37 C.F.R. 1.116, which after final rejection permits entry of amendments placing the claims in better form for consideration on appeal. As the present Amendment and attached Declaration under 37 C.F.R. 1.132 is believed to overcome the outstanding rejections under 35 U.S.C. §103, the present Amendment and Declaration under 37 C.F.R. 1.132 places the application in better form for consideration on appeal. It is therefore respectfully requested that 37 C.F.R. 1.116 be liberally construed, and that the present Amendment be entered.

CONCLUSION

In view of above remarks, reconsideration of the outstanding rejection and allowance of pending claims 1-13 is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone Timothy J. Maier, Reg. No. 51,986, at the number listed below.

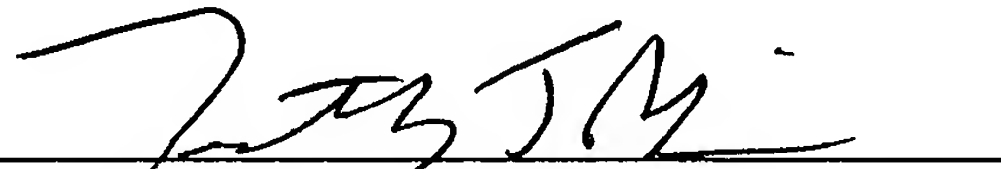
³ See M.P.E.P. 2142 stating, as one of the three "basic criteria [that] must be met" in order to establish a *prima facie* case of obviousness, that "the prior art reference (or references when combined) must teach or suggest all the claim limitations," (emphasis added). See also M.P.E.P. 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

Pursuant to 37 C.F.R. 1.17 and 1.136(a), the Applicants respectfully petition for a one (1) month extension of time for filing a response in connection with the present application, and the required fee of \$110.00 is attached.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Very truly yours,

HARNESS, DICKEY & PIERCE, PLC

By 
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APPENDIX I

